

Factoring Polynomials: COMMON FACTORING

Factoring algebraic expressions is the opposite of expanding:

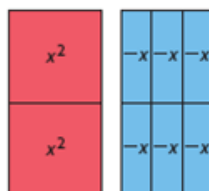
$$\begin{array}{c}
 \text{expanding} \\
 \xrightarrow{\quad} \\
 2x(3x - 5) = 6x^2 - 10x \\
 \xleftarrow{\quad} \\
 \text{factoring}
 \end{array}$$

To common factor:

- Look for the greatest common element of each term in the expression (a number and/or a letter).
- Divide each term by the common factor.

Example #1: Finding the Greatest Common Factor using Algebra Tiles & Symbols

Factor $2x^2 - 6x$



Arrange the tiles for *each* term into rectangles with the *greatest possible width of the two terms* → the greatest possible width for the x^2 tiles is _____

The length is _____

Looking at each term:

$$\begin{array}{l}
 \begin{array}{cc} 2 & 1 \\ 3 & 6 \end{array} \quad \begin{array}{l} \text{The greatest common factor of the coefficients} \\ \text{and 6 is } \underline{2} \end{array} \\
 \begin{array}{l} \text{The greatest common factor of the variables } x^2 \\ \text{and } x \text{ is } \underline{x} \end{array}
 \end{array}$$

$\begin{array}{cc} 1 & 2 \\ & \vee \end{array}$
 $(x^1)(x^1)$

→ the *greatest common factor* is $\underline{2x}$

Divide each term by the common factor:

$$\frac{2x^2}{2x} - \frac{6x}{2x} = \underline{x - 3}$$

$$\therefore 2x^2 - 6x = \underline{2x(x - 3)}$$

Example #2: Using Reasoning to Factor

Factor: $2x(x+3) - 5(x+3)$

$$\checkmark x+3(2x-5)$$

$$\frac{2x(x+3) - 5(x+3)}{(x+3)(x+3)}$$

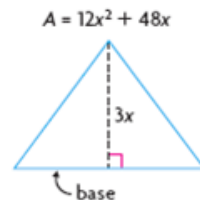
$$\frac{0}{0}$$

Example #3: Problem Solving by Common Factoring

A triangle has an area of $12x^2 + 48x$ and a height of $3x$. What is the *length* of the base?

$$A = \frac{bh}{2}$$

$$\begin{aligned} (12x^2 + 48x) &= \frac{b(3x)}{2} \\ 24x^2 + 96x &= b(3x) \\ \frac{24x^2}{3x} + \frac{96x}{3x} &= \frac{b(3x)}{3x} \\ 8x + 32 &= b \end{aligned}$$



$$\frac{1}{2}(2)$$

$$x^0 = 1$$

More Examples: Fully factor the following:

a) $4x - 8$

$$\begin{aligned} 4 &= 1, 2, 4 \\ 8 &= 1, 2, 4, 8 \end{aligned}$$

$$4(x-2)$$

b) $2x^3 - 16x^2 - 10x$

$$\begin{aligned} 2 &= 1, 2 \\ 16 &= 1, 2, 4, 8, 16 \\ 10 &= 1, 2, 5, 10 \end{aligned}$$

$$2x(x^2 - 8x - 5)$$

$$\frac{2x^3}{2x} - \frac{16x^2}{2x} - \frac{10x}{2x}$$

c) $10ax^3 + 15abx^2 - 30ax$

$$5ax(2x^2 + 3bx - 6)$$